

## Method for Assessing Secondary Deformations of the Nose After Heilo Uranoplasty

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Received 28<sup>th</sup> May 2023,  
Accepted 29<sup>th</sup> Jun 2023,  
Online 31<sup>st</sup> Jul 2023

**Abstract:** Obviously, congenital anatomical anomalies that disrupt facial anatomy can cause cognitive and psychological consequences. In patients with cleft lip and palate, the consequences can be negative psychosocial changes, ranging from low self-esteem to the risk of social isolation.

**Key words:** nose deformity, cleft nose, unilateral cleft nose, rhinoplasty.

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**Introduction:** Aesthetic assessment of persons with cleft lip and palate is an important clinical indicator in the analysis of facial deformities and planning surgical treatment. The aesthetic appearance of the nasolabial region is one of the most important tools for assessing the success of the treatment. A variety of surgical techniques are used to correct cleft lip and palate, but the results are usually analyzed subjectively and without standardization and depend on the specific point of view of the observer, which may be influenced by ethnicity, culture, and the age of the patient.

### Secondary deformity of the nose.

Secondary deformations are both inherent in the anomaly and iatrogenic. Factors causing residual cleft lip/nasal deformity after primary repair include: infections, hematomas, seromas, lip divergence, suture abscess occurring 2-3 weeks after primary repair, technical failures in primary repair such as misalignment of the wire Cupid, insufficient isolation of the orbicularis musculus and inadequate stitching of all its fibers, inadequate reconstruction of the nose, or postoperative trauma, and the influence of facial growth.

**Application mMethods for pre- and postoperative evaluation of the results of surgical correction of secondary nasal deformities.**

**Materials and methods of research.** The study sample included 40 men and 66 women aged 15 to 35 years, the mean median age was 20.3 years, and the mean age was  $19.7 \pm 1.8$  years in female patients and  $18.2 \pm 4.8$  years in men.

The patients included in this retrospective study on the use of the surgical method were divided into 2 groups: group 1 consisted of 56 patients who underwent rhinoplasty using a cartilage suspension and a composite VY-cartilage flap, septoplasty using a septal cartilage graft to correct a cleft nasal deformity. The 2nd group included 50 patients who underwent only rhinoplasty using a cartilage suspension and a composite VY cartilage flap.

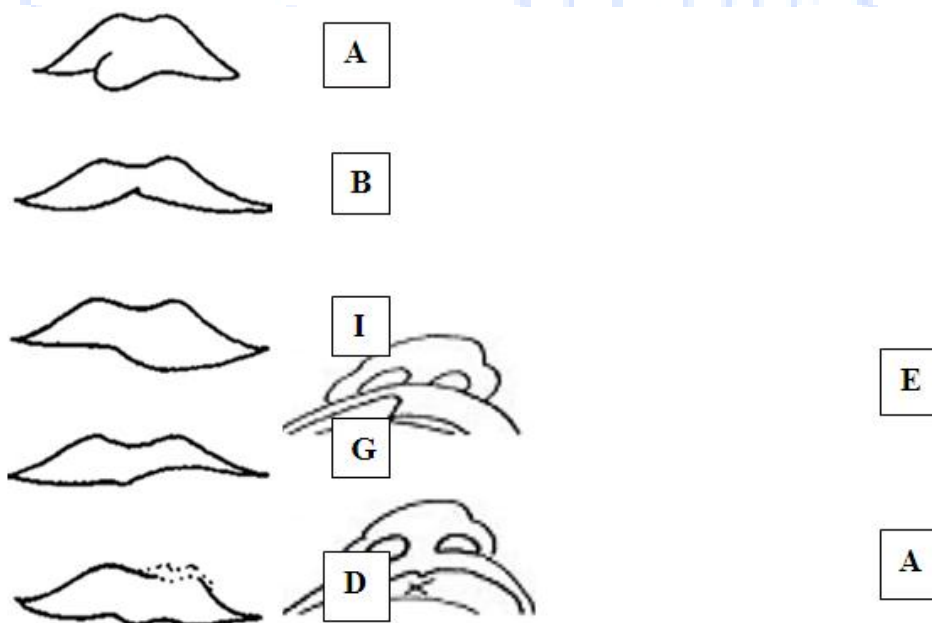
There were no statistically significant differences and no perioperative complications between the groups.

Of the instrumental methods of examination, chest X-ray examination was carried out in order to exclude inflammatory diseases of the respiratory system and ECG.

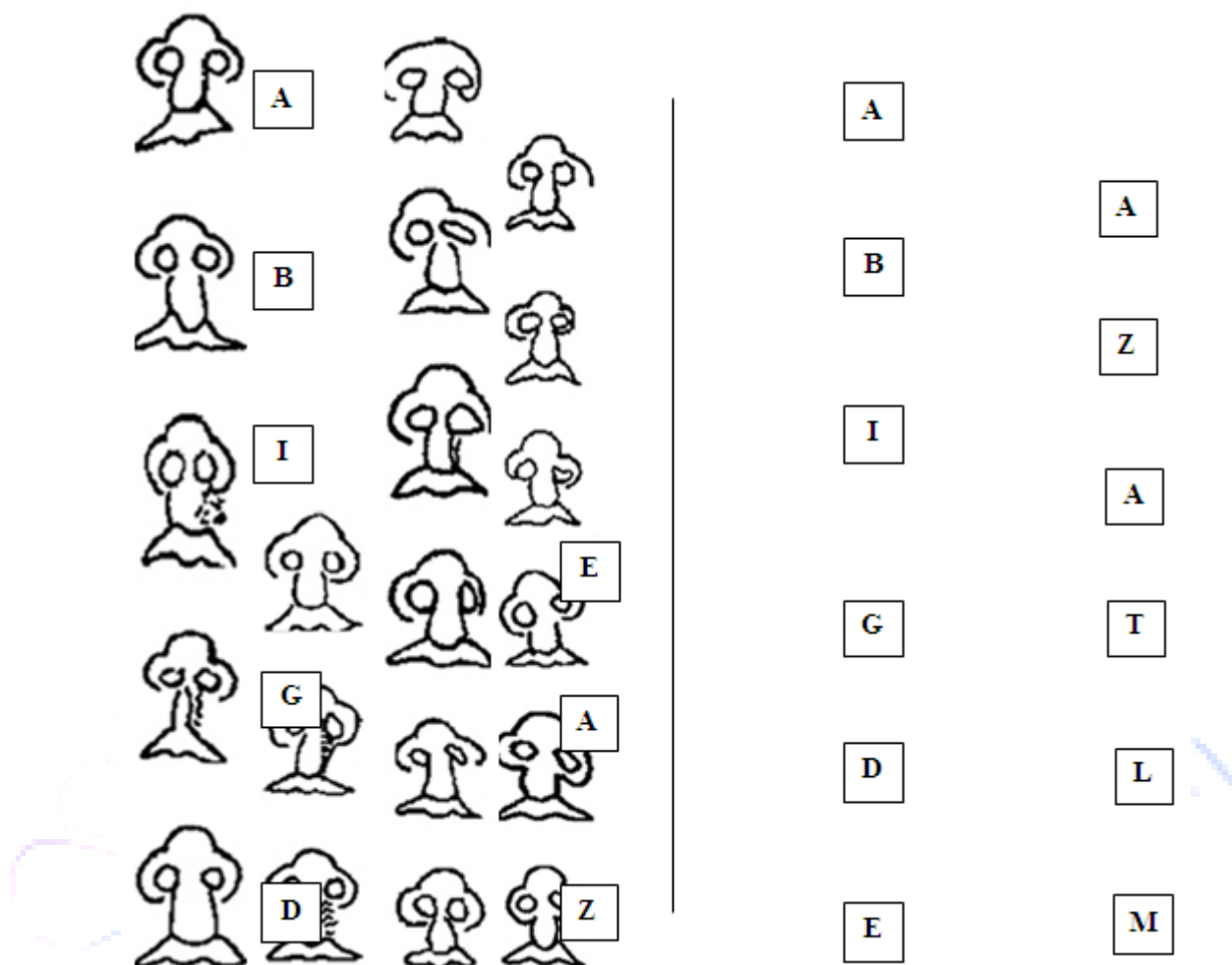
The angles of septal deviation were recorded before the operation, as well as after the operation using computed tomography. The deflection angle was recorded for C-shaped septal deviation or multiple angles for S-shaped septal deviation.

Assessment of secondary deformities of the lips/palate/nose after unilateral cleft lip and palate repair was carried out as follows:

- (1) application of the classification of cleft lip, cleft lip arch, and cleft lip according to the Kernahan Y-classification.
- (2) definition of methods for primary repair of unilateral cleft lip according to Millard;
- (3) assessment of deformities of the lips/nose after unilateral cleft lip repair according to the Motier postoperative rating scale and according to these illustrations.



**Appreciation of the upper lip. (A) Convex/keloid; (B) V-shaped expression; (B) Unilateral thickening of the lip; (D) Unilateral thinning of the lip; (E) Deviation of lip contour and vestibular tubercle (E) Narrow lip contour; (G) Wide lip contour.**



**Rice. 4.2. I. Evaluation of the white roller (left).** (A) Too short; (B) Too long; (B) M. orbicularis oris tissue deficiency; (D) Cupid's bow and filtrum are narrow; (E) Cupid's bow and filtrum wide; Scar - (E) good; (G) contracture; (C) keloid

**I. Nose evaluation (right).** (A) Short columella; (B) Deviation of the nasal septum; (B) Wide nose threshold; (D) Narrow threshold of the nose; (E) Subnasal part too wide; (E) Subnasal part too narrow; (G) Slight dorsum of the alae; (H) Pronounced incurvation of the wings of the nose; (I) Defect in the contours of the upper nostril; (K) High position of the nasal wings; (L) The low position of the nasal wings; (M) Flat and hypoplastic type of nasal wings.

#### Evaluation of lip/nose deformity after unilateral cleft lip repair

Antomic elements	Grade	Points
Vermilion	Convex	0.5
	V-neck	0.5
	Unilateral thickening of the lip	1
	Unilateral lip thinning	3
	Deviation of lip contours	0.5
vestibular tubercle	Narrow	1
	Too wide	2
white roller	Too short	1
	too long	1

	M. orbicularis oris tissue deficiency	3
	Cupid's bow and filtrum are narrow	4
	Cupid's bow and wide filtrum	2
Scarring	Good	0
	Contracture	1
	Keloid	1
Nose	short columella	0.5
	Deviation of the nasal septum	2
	Wide nasal threshold	0.5
	Narrow threshold of the nose	0.5
	Subnasal part too wide	0.5
	Subnasal part too narrow	0.5
	Slight kinking of the nose	0.5
	Severe folded nose	0.5
	Defect in the contours of the upper nostril	0.5
	The high position of the nasal wings	0.5
	The low position of the nasal wings	0.5
	Flat and hypoplastic type of nasal wings	3.0

At initial presentation, patients were clinically and radiologically assessed and photographs were taken with an 8 megapixel camera with 3.5x optical zoom. Pre- and post-operative photographs were used to assess aesthetics in the vertical and horizontal planes before and after surgery. Mean results were calculated and validated with cephalometric values to avoid discrepancies after photographic evaluation. Cephalometry values were calculated from preoperative and postoperative lateral cephalograms, which were used to evaluate sagittal esthetics.

The extranasal clinical examination included:

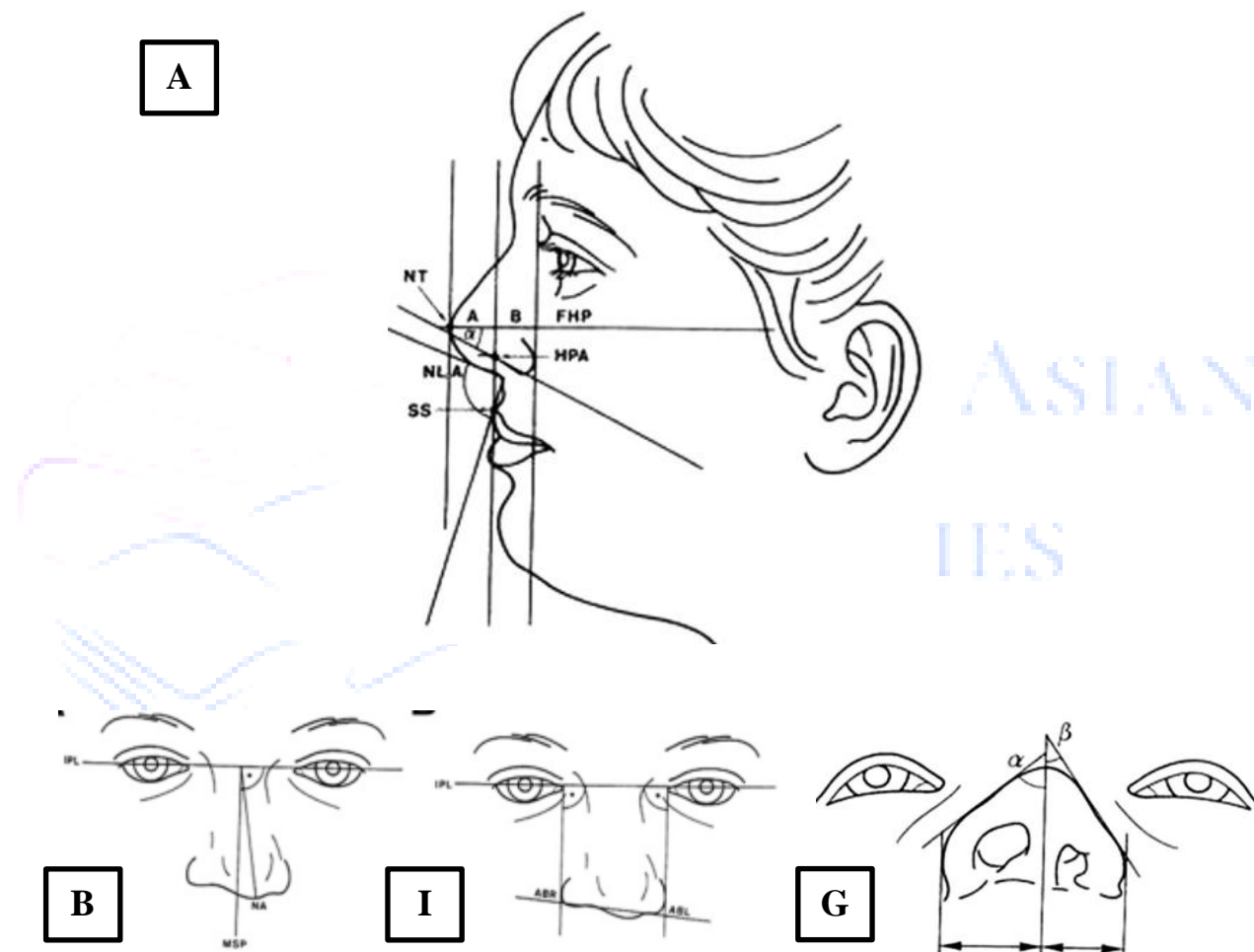
- (1) deviation of the dorsal part from the midline;
- (2) the presence of any irregularities along the dorsal part;
- (3) inspection of the tip;
- (4) the position of the columella;
- (5) wing base width;
- (6) width of individual nostrils;
- (7) skin.

The intranasal examination included:

- (1) position of the nasal septum;
- (2) coulters;
- (3) nasal valve;
- (4) nasal conchas;
- (5) upper lateral cartilages;
- (6) nasal back;
- (7) nasal floor.

The elements of this classification are various residual deformities that have not been corrected, acquired new deformities, or unaesthetic results. At the same time, this method of assessment is based on anatomical divisions.

Aesthetically, the nose was assessed in the vertical, horizontal and sagittal planes. The deviations of the nose from the midsagittal plane were measured in the vertical plane. The position of the base of the wings relative to the interpupillary line was measured for vertical wing dystopia. The nasolabial angle was measured in the sagittal plane and was considered satisfactory if it ranged from  $95^{\circ}$  to  $105^{\circ}$ . The horizontal distance was measured from the middle of the columella to the buccal groove on each side. The wingtip angle was measured on each side. Thus, the wings, columella and tip of the nose were evaluated separately and in combination. All these measurements were taken on the side of the cleft.

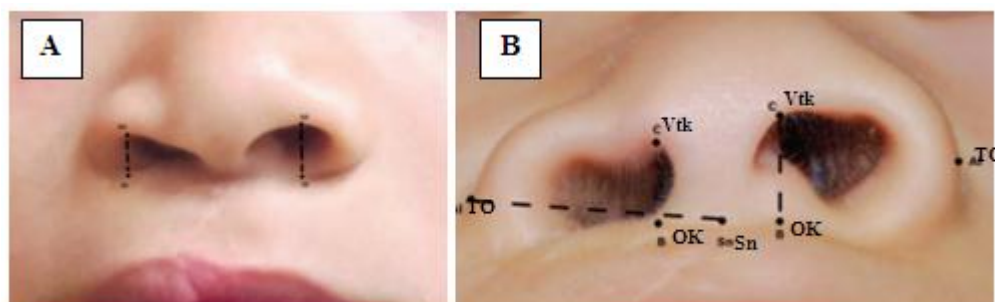


**Measurement in the vertical plane. (A) Assessment of the sagittal axis: NT - Nasal tip, NLA - Nasolabial angle, SS - Superior stomion, HPA - Highest point on the edge of the wings, FHP - Frankfurt horizontal plane, A - Projection of the nasal tip, B - Distance from the left wings to the middle of the columella. (B) Deviation of the axis of the nose; (B) Estimation of the vertical position of the bases of the alae; (D) Estimation of the horizontal axis.**

#### **Methods for postoperative evaluation of the results of surgical correction of secondary nasal deformities after primary plasty**

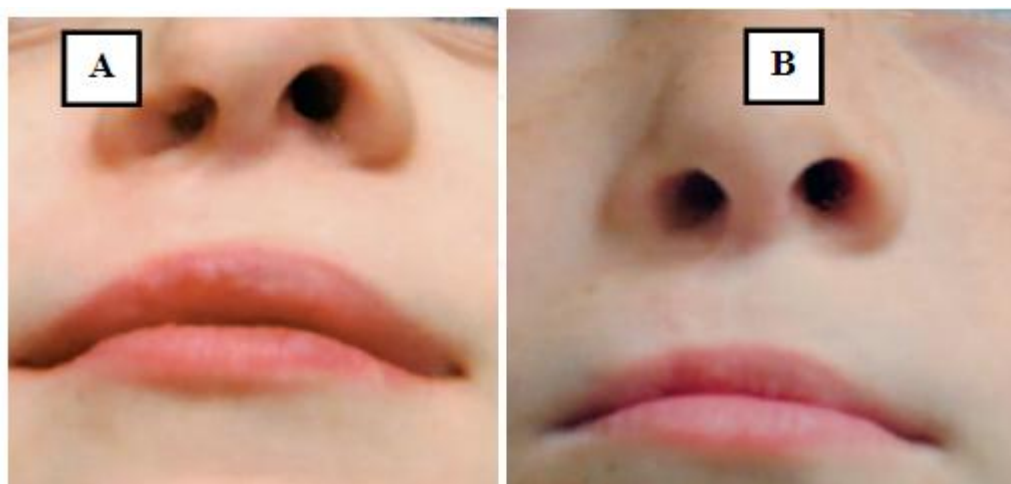
Anthropometric values were used as an objective representation of the shape of the nose. The uppermost point of the nostril margin and immediately below it a point at the level of the nasal floor were non-anthropometric landmarks identified in AP views representing the height of the nasal apex.

In worm-eye projections, the width of the base of the wings, defined as the distance from the subnasal level to the wings of the nose, and the length of the columella, defined as the distance from the base of the columella to the top of the columella, were measured.



**Anatomical landmarks for photogrammetric analysis. (A) Anterior-posterior view. The height of the tip of the nose; (B) Projection "worm's eye". Sn - subnasal; K - Wing; Ok - the base of the columella; C, apex of columella**

After surgery, patients were examined 7 days after surgery, and then the results of surgery were analyzed at least 6 months after surgery by clinical examination. Photographs were taken at each consultation.



**Comparative aesthetic result before and at 6 months postoperative period (A) Anteroposterior view. (B) Projection "worm's eye".**

Postoperative outcomes were evaluated in points by assigning points to each residual anomaly, depending on the complexity of its surgical correction. According to the result of evaluating the deformation of the lip/nose after plastic surgery of unilateral cleft lip and palate, the prognosis of the results of secondary operations was studied.

#### **Prediction of the results of surgical correction of secondary deformities of the nose with unilateral cleft lip and palate**

Options	Points
Great	0-1.5
Very good	2-3.5
Good	4-5.5
Satisfactory	6-8
Bad	8.5-16



### Data analysis of the NOSE questionnaire

Nasal function was assessed 3 months after surgery both subjectively and objectively using the nasal obstruction symptoms score (NOSE).

#### NOSE scale for assessing the symptom of nasal obstruction

Options	Absence	Light	Moderate	Significant	Expressed
Nasal congestion or stiffness	0	1	2	3	4
Nasal congestion or obstruction	0	1	2	3	4
Nose breathing problems	0	1	2	3	4
Sleep problems	0	1	2	3	4
Shortness of breath during exercise	0	1	2	3	4

Data from the NOSE questionnaire were recorded in the patients' medical records before surgery and at each postoperative visit. Postoperative analysis of the NOSE questionnaire used records from the last control questionnaire. The parameters considered to evaluate the condition of the nose included nasal congestion, nasal obstruction, difficulty breathing through the nose, difficulty sleeping, and difficulty breathing air through the nose during exercise. The overall breathing problem was assessed before and after surgery using a linear symptom rating scale.

### Analysis of the aesthetic result of rhinoplasty using the VAS questionnaire

Satisfaction questionnaires before and after rhinoplasty surgery were obtained from patient records at the same time points (3 months after surgery) as the NOSE questionnaire. Data were scored from 0 to 10 using the visual analogue scale (VAS) method to evaluate the appearance of the dorsum, apex, nostrils and columella, wing and wing base. A score less than 6 correlates with dissatisfaction, while a score greater than 6 correlates with satisfaction. An overall score of less than 30 correlates with dissatisfaction, and an overall score of more than 30 correlates with satisfaction.



**Visual analog scale (VAS). Score by VASout of 10 × 10 = score by VASout of 100.**

Patients were then asked to indicate the score on a scale (1-10) that best fits their nasal obstruction severity status.

This questionnaire was first presented by Alsaraf et al. and modified by several groups of scientists. This questionnaire was also modified by us in order to more specifically assess the subjective sensations of patients depending on the use of septoplasty in combination with rhinoplasty. All questions asked are listed in the first column, which patients answered and scored each question from 0 to 4 points, where 0 is the lowest value and 4 is the highest value; the total score was 20 points. The other two columns show the response scores for each question before and after surgery, detailing the mean ± standard deviation, and the median (the most commonly assigned score). This survey was carried out 3 months after the operation.

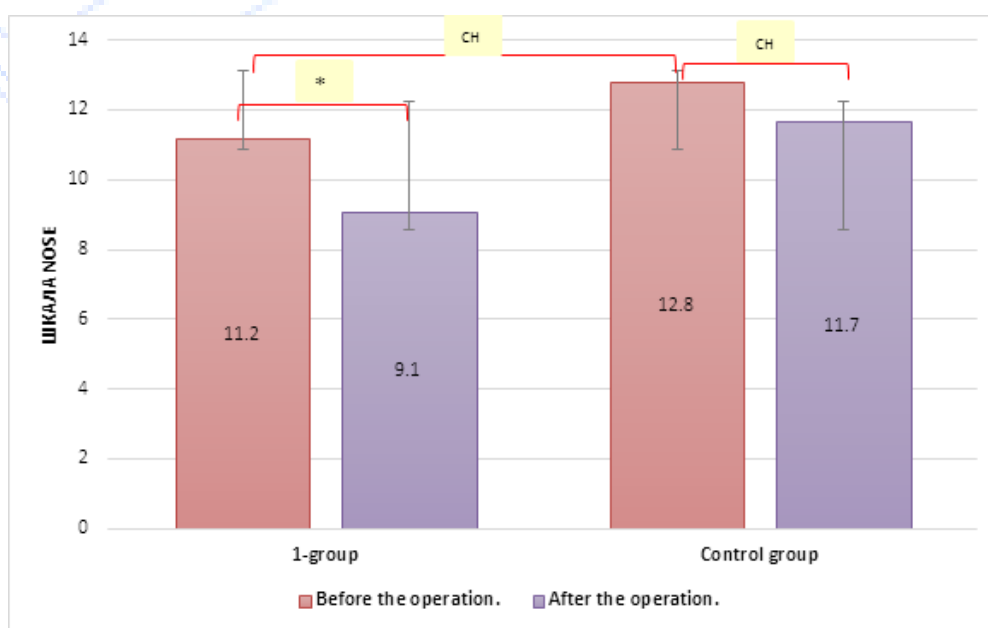
Options	Absence	Light	Moderate	Significant	Expressed
Do you like the way the nose looks?	0	1	2	3	4
Nasal congestion resolution	0	1	2	3	4
Improved breathing through the nose	0	1	2	3	4
Resolution of rhinitis symptoms	0	1	2	3	4
Sense of smell improvement	0	1	2	3	4

**RESULTS:** The NOSE scale and defined nasal septal deviation angles were used to conduct a comparative analysis of nasal ventilation function and nasal septum deviation between the two surgical groups (group 1 (n=56) - rhinoplasty using a cartilage suspension and a composite VY-cartilage flap, septoplasty using a septal cartilage graft; 2nd control group (n=50) - rhinoplasty with cartilage suspension and composite VY cartilage flap).

Nasal obstruction in both groups had the same preoperative severity, which was reflected in the NOSE score ( $p>0.05$ ). However, after surgery, only in patients of the 1st group, nasal obstruction significantly decreased ( $p<0.05$ ).

The deviated septum was subdivided into 4 subgroups depending on the angle of deviation to understand and simplify the structure of the nasal septum: normal (angle of deviation  $\leq 5^\circ$ ), mild (angle of deviation from 5 to  $10^\circ$ ), moderate (angle of deviation from 10 to  $20^\circ$ ) and pronounced (angle of deviation  $>20^\circ$ ).

The angles of deviation of the nasal septum in both groups did not have significant differences before surgery ( $p>0.05$ ). However, the deviation angles of the nasal septum decreased only in the 1st group in the postoperative period (from  $11.2 \pm 3.9$  to  $9.1 \pm 2.35$  after surgery;  $p<0.05$ ).



**Nasal Obstruction Symptom Evaluation Results**  
(NOSE scale): CH - statistically insignificant; \* $p<0.05$



### Comparative postoperative results of functional satisfaction between groups based on the ROE questionnaire (n=106; 56/50)

Parameter	Group 1 rhinoplasty + septoplasty (n=56)		The second group - rhinoplasty (n=50)		
	Cp±SD	n(%)	Cp±SD	n(%)	R
Do you like the way the nose looks?	3.84±0.04	55 (98.2)	2.85±0.38	38 (76)	p<0.01
Nasal congestion resolution	3.65±0.29	54 (96.4)	2.94±0.15	40 (80)	p<0.05
Improved breathing through the nose	3.78±0.34	54 (96.4)	2.87±0.18	37 (74)	p<0.01
Resolution of rhinitis symptoms	3.67±0.15	49 (87.5)	3.51±0.24	45 (90)	p>0.05
Sense of smell improvement	3.72±0.24	52 (92.8)	3.05±0.18	43 (86)	p<0.05

Thus, the subjective assessment of patients indicates a more significantly superior aesthetic and functional effect of rhinoplasty in combination with septoplasty, which is confirmed by the results of a survey of patients in the postoperative period.

#### Conclusions:

According to the NOSE scale, in patients of the 1st group (rhinoplasty with cartilage suspension and composite VY cartilage flap, septoplasty with septal cartilage graft) nasal obstruction, the angles with a pronounced deviation of the nasal septum decreased statistically significantly ( $p<0.05$ ) compared with patients of the 2nd group (rhinoplasty with cartilage suspension and composite VY-cartilage flap), which contributes to adequate functional rehabilitation of the respiratory system of patients.

The modified ROE questionnaire showed 87.5% to 98.2% functional and aesthetic subjective satisfaction in the group of patients who underwent combined surgery-rhinoseptoplasty, while in patients with rhinoplasty this parameter was 74%-90% ( $p<0.05$ ).

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